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Original article

In vitro litholytic activity of some medicinal plants on urinary stones

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KEYWORDS

Urinary stones;
Litholytic activity;
Trigonella foenum-graecum;
Petroselinum crispum;
Opuntia ficus-indica

Abstract

Objective: This study was designed to evaluate the effect of plant extracts used in traditional medicine on the dissolution of three types of kidney stones.

Subjects and methods: Kidney calculi of cystine; uric acid and pure carbapatite were incubated in vitro during 6 weeks in the presence of three of plant extracts and of 0.9% NaCl solution used as control. An extract of each plant was prepared by infusion of three grams of powdered plants during 30 min in 100 mL of a boiled NaCl 0.9% aqueous solution. Each extract was then filtered and thereafter set in a flask containing a stones. At the end of each week the stone was removed from the experimental medium and weighted after a 18 h drying at 40 °C.

Results: After 6 weeks of experiment and with in vitro study, we are observed that the aqueous extract of the seeds of *Trigonella foenum-graecum* has a better effect on dissolution of cystine and carbapatite stones ($p < 0.05$), with mass loss of 94 mg and 73 mg respectively at the end of experiment. While with NaCl solution, the mass was small.

Conclusion: Our experiment failed to demonstrate a significant effect of the tested plant extracts to dissolve three types stones in vitro. However, we observed that only the extract of the seeds of *T. foenum-graecum* has a better effect on dissolution of cystine and carbapatite stones probably resulting from formation of complexes between stones and polyphenols or flavonoids present in the extracts.

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Introduction

The renal lithiasis is well known from long time ago and it has shown to be indissociable from human history. The development of the stones is related to the decrease of urine volume or the increase of excretion of stone-forming components such as calcium, oxalate, urate, cystine, xanthine, and phosphate. Urolithiasis is a common health problem with increasing prevalence of up to 20% all over the globe. The increased prevalence of the disease is due to the lifestyle changes such as lower dietary intake of vegetables or fruit, higher consumption of animal proteins, salt, sweetened beverages, and inadequate fluid intake. Calcium oxalate stones are the most common type of nephrolithiasis [1].

In Morocco, Few studies have been done on urolithiasis, aiming to determine the composition of urinary calculi collected in certain regions [2–7]. These studies had shown the preponderance of calcium oxalate monohydrate as the major component of urinary calculi (66.6%), followed by anhydrous uric acid (18.1%), carbatipate (7.9%) and cystine (0.6%) [7].

In Morocco, more people are using traditional medicine to treat this disease, because in one hand the price of conventional medicines is relatively high, in another hand they can have a limited effect. As an example the diuretics, the anti-inflammatory and the inhibitors of some metabolites are the only medicines used to treat oxalocalcic lithiase, though with adverse effects.

Several plants have been subject to scientific studies in Morocco and around the world to evaluate the litholytic activity in an in-vitro system like: *Herniaria hirsuta*, *Zea mays*, *Ammi visnag*, *Zizyphus lotus L.* [8,9].

The uses of plants extracts, essentially targeting this oxalocalcic lithiasis, have been the object of several publications [10–13]. Thus, just few studies have been interested in more rare lithiasis, often due to difficulties in social care like cystine, carbatipate and uric acid lithiasis.

Dissolution therapy can be employed in patients with uric acid stones includes urinary alkalization, hydration, modification of diet and allopurinol [14], for cystinic patients the aim of dissolution therapy is to hydrate and alkalize the urine. A further treatment strategy is the addition of drugs that convert cystine to compounds that are more

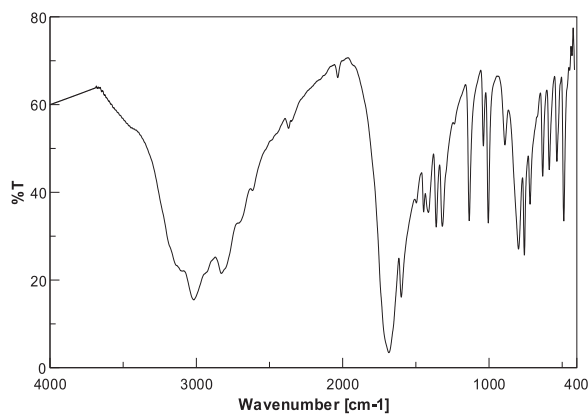


Figure 1 IR Spectrum of Uric Acid.

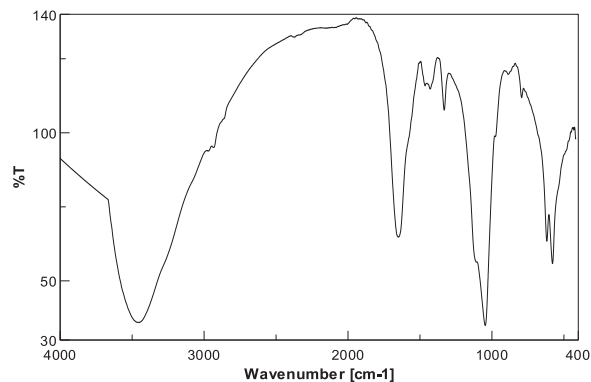


Figure 2 IR Spectrum of Carbatipate.

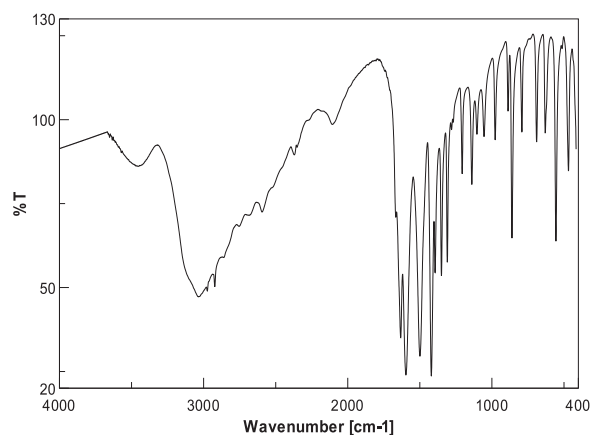


Figure 3 IR Spectrum of Cystine.

soluble at lower pH values. Cystine stones are exceedingly hard and usually do not respond well to extracorporeal shockwave lithotripsy, hence if there is treatment failure with dissolution therapy then usually flexible uretero-renaloscopy or percutaneous nephrolithotomy is required [15,16].

The aim of this study was to realize a phytochemical screening of some medicinal plants, and to evaluate their dissolving effect including *P. crispum* (leaves and stalks), *O. ficus-indica* flowers, and *T. foenum-graecum* seeds already used in traditional medicine to cure renal lithiasis. To do so, we have observed in vitro the variation of calculi weight; kinetic aspects of this dissolution; (cystine, carbatipate and uric acid lithiasis) during the whole experience, which last six weeks.

Subjects and methods

Urinary calculi

Three pure samples for each type of calculi cystine, uric acid and carbatipate coming from Ibn Sina University Hospital, Rabat, Morocco have been selected, from a sample library of the Analytical Chemistry Laboratory of the Faculty of Medicine and Pharmacy of Rabat, after a spectrophotometry analysis using Fourier Transformed Infrared (FTIR) according to the protocol described by Benramdan et al. [6]. No information on the personal data of the patients has been revealed. Figs. 1–3 show the IR specters of selected kidney calculi.

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